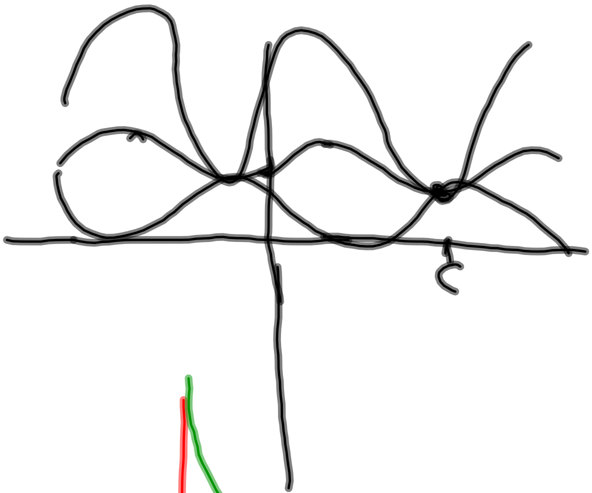
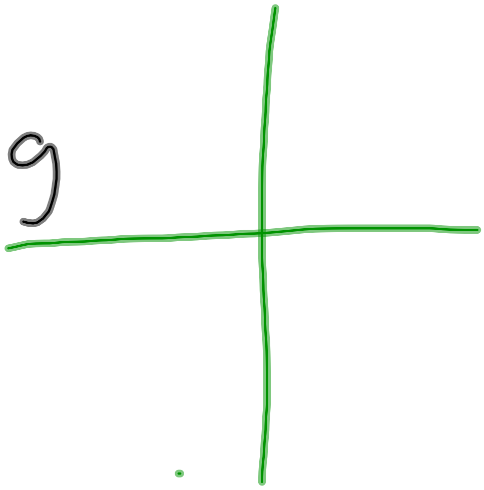
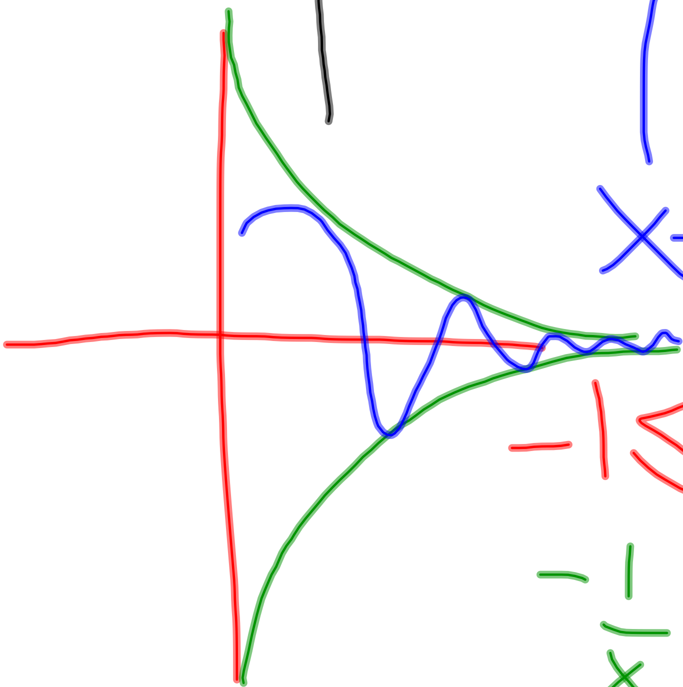
$$\lim_{x\to c} \sin x = \sin c$$

Squeezing



$$\lim_{x\to\infty} \frac{\sin x}{x} = 0$$



$$-1 \le \sin x \le 1$$

$$-\frac{1}{x} \le \frac{\sin x}{x} \le \frac{1}{x}$$

$$\frac{\displaystyle\lim_{x \to 0} \frac{\sin x}{x} = 1}{\displaystyle\lim_{x \to 0} \frac{1 - \cos x}{x} = 0}$$

$$\lim_{x \to 0^+} \frac{\sin x}{x^2}$$

$$= \lim_{x \to 0^+} \overset{\to +1}{\left(\frac{\sin x}{x}\right)} \overset{\to +\infty}{\left(\frac{1}{x}\right)}$$

$$= \infty$$

1. $f(x) = \sin(x^2 - 2)$

NO discontinuties

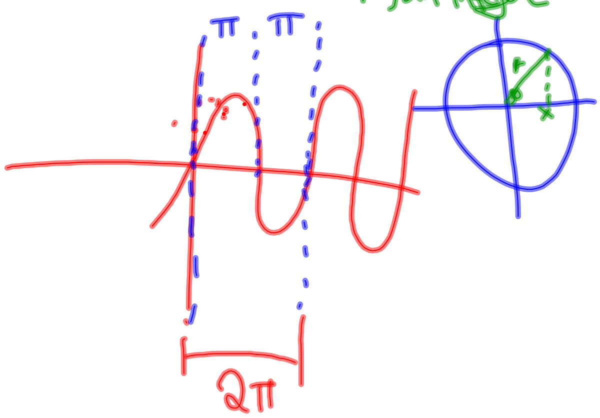
2. $f(x) = \cos\left(\frac{x}{x-\pi}\right)$

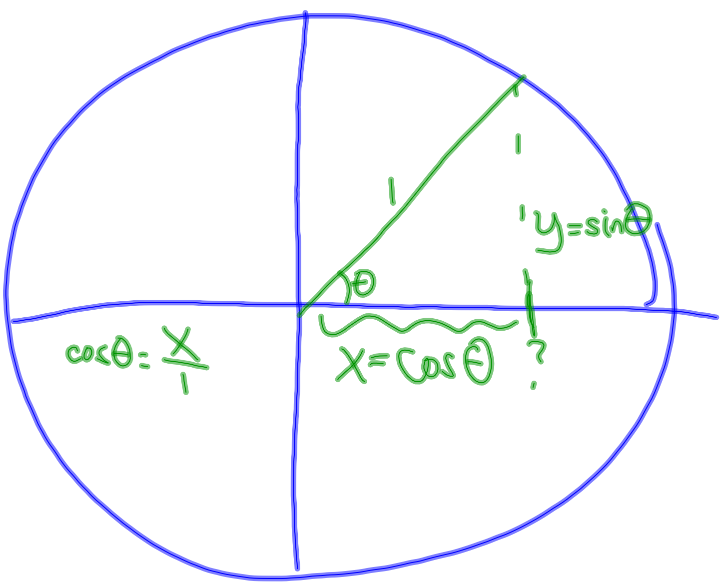
$x$ - - - - - $x = \pi$ - - - - - start - - -

3. $f(x) = \cot x = \frac{1}{\tan(x)} = \frac{\cos(x)}{\sin(x)}$

discontinuos at $x = \pi n$

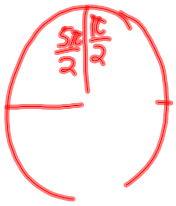
$n$, an integer



4.) $f(x) = \sec(x) = \frac{1}{\cos(x)}$

$x \neq \frac{\pi}{2} \pm n\pi$



5) $f(x) = \csc x = \frac{1}{\sin x}$

$\sin x = 0 = \sin(\pi)$

$x \neq \pi$ & $0$ & $\pi N$

6) $f(x) = \frac{1}{1+\sin^2(x) = 0}$

no discontinuity

$1+\sin^2(x) = 0$

$\sin^2(x) = -1$

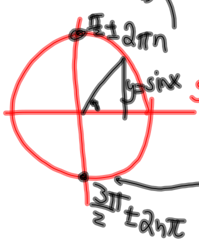
6*) $f(x) = \frac{1}{\sin^2(x) - 1}$

$\sin^2 x = 1$

$x \neq \frac{\pi}{2} \pm \pi n \quad \sin x = \pm 1$

$(\sin(x))^2 = 1$

$(\sin(x)) = \pm 1$



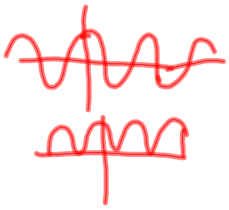

$\sin x = +1$

$\sin x = -1$

$\frac{3\pi}{2} = \frac{\pi}{2} + \pi$

7) $f(x) = |\cos(x)|$

Always continuous



Start here

$f(x) = \sqrt{2 + \tan^2(x)}$

CALCULUS class

$\therefore 2 + \tan^2(x) \geq 0$ ✓

no discontinuities arise when $2 + \tan^2 x < 0$

$\tan^2 x \geq 0$

$\tan^2 x + 2 \geq 2$

P.II

$\tan^2 x = \left(\frac{\sin x}{\cos x}\right)^2$

$\boxed{\begin{array}{l}\cos x = 0 \\ x = \frac{\pi}{2} \pm \pi n\end{array}}$ discontinuities

$\sqrt{2 + \tan^2 x}$

is $\tan x$ always defined?

No

not at

$x = \frac{\pi}{2} \pm n\pi$

when $\tan x$ is defined do I ever take the square root of a negative number?

NO

$2 + \tan^2 x \geq 2$

13. $$\lim_{x \to +\infty} \cos\left(\frac{1}{x}\right)$$

$$= \cos\left(\lim_{x \to \infty} \frac{1}{x}\right) =$$

$$\cos(0) = 1$$